

FLORISTICS OF RESERVES AND BUSHLAND AREAS OF THE WHICHER SCARP 1: FLORA AND VEGETATION OF DARDANUP FOREST BLOCK

By GREG KEIGHERY¹, BRONWEN KEIGHERY² and NEIL GIBSON¹

¹Department of Environment and Conservation, Wildlife Research Centre, P.O. Box 51, Wanneroo, Western Australia, 6065.

²Department of Environment and Conservation, Locked Bag 104, Bentley Delivery Centre, WA 6983.

ABSTRACT

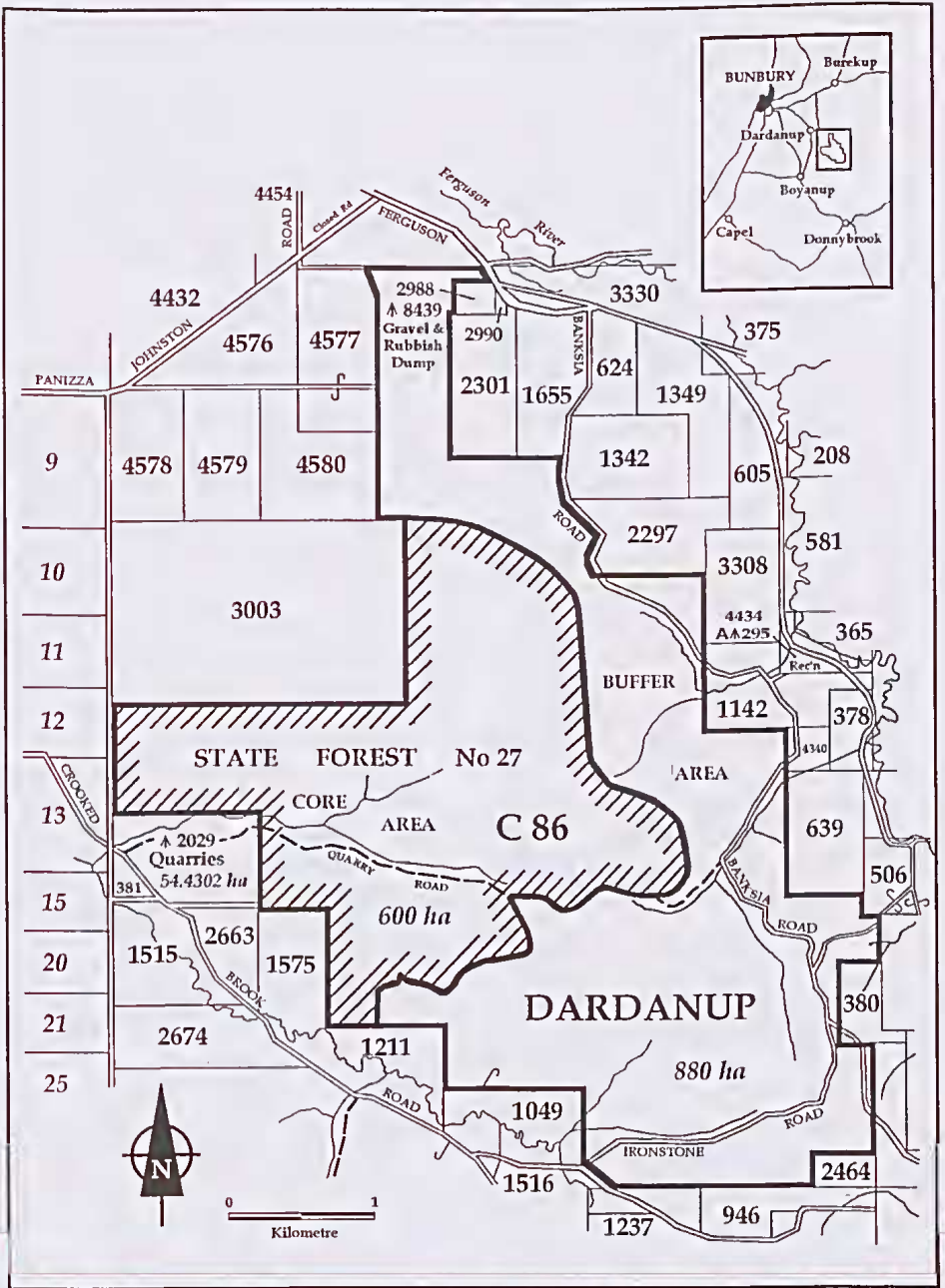
Dardanup Forest Block is the only vegetated proposed conservation area known to encompass the Darling and Whicher Scarps and associated foothills. Three principal plant communities are present in the area: Jarrah woodland, Marri-Jarrah-Mountain Marri woodland and *Banksia* woodland. To the west of the Dardanup Forest Block two regional floristic community types are represented, type 1a: *Eucalyptus haematoxylon*-*E. marginata* woodlands of the Whicher Foothills and type 1b: Southern *Banksia* woodlands. The Jarrah forest on the eastern side of the Block represents the western edge of the Darling Plateau. Types 1a and 1b are at or near their northern limits in Dardanup Block. These are some of the largest known occurrences of these poorly reserved community types.

The block contains a vascular flora of 497 taxa of which 457 are natives and 40 weeds. Six of these taxa are non-flowering plants, 180 are monocotyledons (164 natives and 16 weeds) and 310 are dicotyledons (286 natives and 24 weeds). Five priority taxa (*Acacia flagelliformis*, *Acacia semitrullata*, *Caladenia longicauda* subsp. *clivicola*, *Chamelaucium erythrochlora* and *Gastrolobium whicherensis*) and four worthy of listing (*Logania* sp. nov., *Lomandra* sp. nov. and *Synaphaea* sp. Donnybrook and *Xanthorrhoea acanthostachya*) are found on the block. Three (*Logania* sp. nov., *Lomandra* sp. nov. and *Synaphaea* sp. Donnybrook) of these taxa were discovered during the survey.

INTRODUCTION

Dardanup Forest Block, an area of approximately 880 hectares is part of State Forest 27. The block is located on the conjunction of

the Whicher and Darling Scarps, approximately 5 kilometres east of Dardanup along Ironstone Road (Map 1). The block was designated in the Forest



Map One. Location of Dardanup Forest Block, Cadastral Data and Adjacent Reserves.

Department Working Plan No. 87 as the Dardanup Management Priority Area (MPA) for the conservation of flora, fauna and landscape, with a core area and a buffer to the east (Map 1).

The System Six study (Department Conservation and Environment 1983) endorsed this designation and suggested that Reserve 2029 of some 54 hectares be added to the MPA (Recommendation C86). This document suggested that the MPA "conserves a range of vegetation associated with the northern extension of the Donnybrook Sunkland [Blackwood Plateau]. Some of these vegetation associations are unique. Open - forest of jarrah [*Eucalyptus marginata*] and marri [*E. or Corymbia calophylla*] and woodland of banksia [*Banksia attenuata*] and paperbark [*Melaleuca* species] are dominant, with some yarri [*E. patens*], bullich [*E. megacarpa*] and swamp banksia [*Banksia littoralis*] occurring in moister areas. The MPA also contains the only extensive stands of mountain gum [Mountain Marri, *E. or Corymbia haematoxylon*] in System Six."

The whole of the lower Darling and Whicher Scarps are subject to major land use conflicts, chiefly from mineral sands mining but, including a golf course proposal for Dardanup Block (A draft of this report was prepared in 1997 in response to such development proposals.). Despite these conflicts, there are

little detailed botanical data available on this area except for the vegetation maps of Heddle *et al.* (1980) and Smith (1973) used in the System Six Study. This block was studied as part of the Swan Coastal Plain survey in 1993 (Gibson *et al.* 1994), since the western lower margins of the block contains the foothills of the Whicher Scarp.

A more complete study to ascertain the conservation significance of the block was undertaken in 1996, at the request of the then Minister of the Environment, in response to repeated requests to alienate large sections of the block. The results are presented here as a first portion of a larger study on the floristics of the Whicher Range.

SURVEY METHOD

Survey work in Dardanup Forest Block was performed over three flowering seasons from 1993 to 1996 in conjunction with regional survey work on the Swan Coastal Plain (Gibson *et al.* 1994) and the System 6 and Part System 1 Update.

Twelve sites were located in the block (Map 2) to sample the range of plant communities identified using aerial photographs and field interpretation. Four are permanently located 100 m² sites used in the regional floristic study of the Swan Coastal Plain (Gibson *et al.* 1994). Groups of conservation volunteers established a further eight permanent

sites in 1996. All sites were sampled on at least two occasions.

Opportunistic plant collections, that is collections made outside the sites, were made during vehicle and foot traverse at various times of the year, during 1996.

GEOMORPHOLOGY AND SOILS

Dardanup Forest Block is located on the Darling Fault and spans the broad geomorphic units, the Darling Scarp, Whicher Scarp, their foothills, and a section of the Swan Coastal Plain (Churchward and McArthur 1980).

The soils comprise lateritic uplands and spurs of the western margin of the Darling Plateau and Scarp, with small areas of outcropping quartzite. To the west, below these areas, are colluvial sands and loams of the Whicher Scarp and, at the far west, is a small area of the Yoganup formation of the Swan Coastal Plain (Anon. 1981).

Dardanup Forest Block is the only area of the forest/conservation estate which spans the Darling Scarp, Whicher Scarp and the Swan Coastal Plain, south-east of Bunbury.

VEGETATION

The Vegetation Map

The vegetation map (Map 2) shows the distribution of the

principal plant communities based on the vegetation descriptions of the 12 sites.

Essentially all the plant communities can be classified as woodlands.

Banksia/Jarrah woodlands (Map 2: bW)

Banksia attenuata dominates the lowest slopes, however, there are often scattered Jarrah trees throughout this area which increase in density towards the base of the scarp. Other low trees are *Banksia grandis*, *Xylomelon occidentale* and *Persoonia longifolia* over a dense understorey of shrubs, herbs and sedges. The characteristic shrubs are *Xanthorrhoea preissii*, *Stirlingia latifolia*, *Bossiaea eriocarpa*, *Jacksonia sparsa*, *Daviesia physodes*, *Hibbertia hypericoides* and the herbs *Patersonia umbrosa* var *xanthina*, *Phlebocarya ciliata*, *Dasyogon bromeliifolius*. Two sedges *Hypolaena exsulca* and *Lyginia barbata* dominate the sedge layer.

Jarrah woodland (Map 2: jw)

Jarrah woodland to forest mixed with varying amounts of Marri is characteristic of lateritic soils. These trees have a dense understorey of shrubs such as *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Acacia latericola*, *Xanthorrhoea gracilis*, *Hakea amplexicaulis*, *Hibbertia cunninghammi*, *Dryandra lindleyana*, *Lechenaultia biloba*, *Bossiaea eriocarpa*, *Isopogon*



Map Two. Vegetation, Floristic Study Sites and Adjacent Remnant Vegetation of Dardanup Forest Block. Solid Black Areas: Remnant vegetation outside Dardanup Forest Block (derived from Western Australian Agriculture Department Remnant vegetation database). Floristic study sites: Dard 01- 08 Sites established as part of Environmental Protection Study in 1996, dard 01- 03 Sites established as part of Gibson *et al.* (1994) Swan Coastal Plain Study. Vegetation communities: bw: *Banksia attenuata* woodland; MmLW: Mountain Marri dominated low Woodland; jw: Jarrah Dominated Woodland.

sphaerocephalus and *Eriostemon spicatus*, and the herbs *Patersonia umbrosa* var *xanthina*, *P. babianoides*, *Trichocline spathulata* and *Lagenifera huegelii*. On the lower slopes Marri becomes dominant

Mountain Marri low woodland
(Map 2: MmLW)

Mountain Marri woodland to low forest with varying amounts of Jarrah and Marri (which can become dominant in deeper colluvial soils) and scattered trees of *Banksia grandis* and *Persoonia longifolia* over a dense understory of shrubs such as *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Adenanthos barbigera*, *Kennedia coccinea*, *Xanthorrhoea gracilis*, *Bossiaea ornata*, *Dryandra lindleyana*, *Isopogon sphaerocephalus*, *Eriostemon spicatus*, *Hakea lissocarpha*, *Hibbertia commutata* and the herbs *Patersonia juncea*, *P. umbrosa* var *xanthina*, *P. babianoides*, *Lagenifera huegelii*, *Lomandra sericea* and *Johnsonia lupulina*. *Tetraria octandra* and *Loxocarya fasciculata* dominate the sedge layer.

A very distinctive form of this community occurs on out-cropping quartzite ridges along the Darling Scarp. Here *Eucalyptus marginata* and *E. haematoxylon* open low woodland occurs over tall heath of *Xanthorrhoea acanthostachya*, *Gastrolobium whicherensis*, *Lambertia multiflora* var *darlingensis*, *Dryandra armata*, *Hakea cyclocarpa* and *Hibbertia hypericoides* over herbs of *Lomandra* sp. nov. and *Patersonia*

limbata. It is likely with further studies along the southern Darling Scarp and adjacent Whicher Scarp this may prove to be a separate floristic community, that is rare and restricted.

Floristic Community Types

The regional floristic survey of the Swan Coastal Plain identified floristic community types, 1a (*Eucalyptus haematoxylon* - *E. marginata* woodlands on Whicher Foothills and type, 21b (Southern *Banksia* woodlands). The first is at its northern limit and the second very near. Both of these floristic community types are vulnerable and poorly reserved communities therefore, these large in the Dardanup Forest Block these are communities significant for their conservation.

The Jarrah woodlands of the western edge of the Darling Scarp represent a new group, but placement of this, and the community of the quartzite ridges, await completion regional floristic survey of the Whicher and Darling Scarps.

FLORA

Dardanup Forest Block contains a vascular flora of at least 497 taxa (Table 1); 457 are natives and 40 weeds. Six of these taxa are non-flowering plants, 181 are monocotyledons (165 natives and 16 weeds) and 310 are Dicotyledons (286 natives and 24 weeds).

Table 1. Dardanup Forest Block Flora List. Habitat Code: Q – Quartzite Heath, D – Disturbed, B – Banksia, S – Swamps or creeklines, J – Jarrah, H – Mountain Marri/Jarrah.

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
Adiantaceae						
Cheilanthes austrotenuifolia				+		+
Amaranthaceae						
Ptilotus manglesii					+	
Ptilotus stirlingii			+		+	
Amaryllidaceae						
* Amaryllis belladonna		+				
Anthericaceae						
Agrostocrinum hirsutum					+	+
Arthropodium capillipes				+		
Borya sphaerocephala	+					
Caesia micrantha					+	+
Caesia occidentalis					+	
Chamaescilla corymbosa var. corymbosa			+		+	+
Johnsonia acaulis				+		
Johnsonia lupulina					+	+
Laxmannia sessiliflora subsp. australis	+		+		+	+
Sowerbaea laxiflora			+	+	+	+
Thysanotus arbuscular			+			
Thysanotus arenarius	+		+			
Thysanotus manglesianus					+	+
Thysanotus multiflorus					+	+
Thysanotus patersonii					+	+
Thysanotus pseudojuncus					+	+
Thysanotus sparteus					+	+
Thysanotus thysoideus					+	+
Tricoryne elatior					+	+
Tricoryne humilis					+	+
Tricoryne tenella	+		+			
Apiaceae						
Actinotus glomeratus			+	+	+	+
Daucus glochidiatus	+		+		+	+
Homalosciadium homalocarpum			+	+	+	+
Hydrocotyle alata			+	+		
Hydrocotyle callicarpa			+			
Hydrocotyle pilifera var. glabrata						
Pentapeltis peltigera					+	+
Platysace filiformis				+	+	+
Platysace tenuissinisa					+	

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
Schoenolaena juncea				+		
Trachymene pliosa	+		+		+	+
Xanthosia atkinsoniana					+	+
Xanthosia candida					+	
Xanthosia ciliata			+		+	
Xanthosia huegelii			+			
Xanthosia tasmanica						+
Araceae						
* Arum italicum		+				
* Zantedeschia aethiopica		+				
Asteraceae						
* Arctotheca calendula	+					
* Conyza albida		+				
Cotula cotuloides		+				
Craspedia variabilis				+		
Gnaphalium gymnocephalum					+	+
Hyalosperma cotula						+
Hyalosperma demissum				+		
* Hypochaeris glabra	+	+	+	+	+	+
Ixiolaena viscosa			+			+
Lagenifera huegelii			+		+	+
Millotia tenuifolia	+		+		+	+
Olearia paucidentata					+	
Pithocarpa pulchella var melanostigma					+	+
Podolepis gracilis						
Podotrochea angustifolia				+		
* Pseudognaphalium luteo-album		+				
Pterochaeta paniculata	+			+	+	+
Quinetia urvillei	+		+	+	+	+
Senecio hispidulus						+
Senecio multicaulis subsp. multicaulis				+		+
Senecio quadridentatus					+	+
Siloxerus humifusus			+			
* Sonchus asper		+		+		
* Sonchus oleraceus	+	+		+		
Trichocline spathulata					+	+
* Vellereophyton dealbatum		+				
Waitzia nitida				+		+
Campanulaceae						
* Wahlenbergia capensis			+			
Wahlenbergia preissii			+		+	+

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
Caryophyllaceae						
* <i>Petrorhagia velutina</i>		+				
Caesalpiniaceae						
<i>Labichea punctata</i>	+			+		
Casuarinaceae						
<i>Allocasuarina fraseriana</i>			+		+	
<i>Allocasuarina humilis</i>			+			
<i>Allocasuarina thuyoides</i>	+		+			
Centrolepidaceae						
<i>Aphelia cyperoides</i>			+	+		+
<i>Aphelia drummondii</i>				+		
<i>Centrolepis aristata</i>			+	+	+	
<i>Centrolepis drummondiana</i>			+			
Clusiaceae						
<i>Hypericum gramineum</i>				+		
Colchicaceae						
<i>Burchardia congesta</i>	+		+		+	
<i>Burchardia multiflora</i>				+		
Crassulaceae						
<i>Crassula colorata</i> var. <i>colorata</i>	+		+		+	+
<i>Crassula colorata</i> var. <i>tuberculata</i>			+			
<i>Crassula pedicellosa</i>			+			
<i>Crassula sieberiana</i> subsp. <i>tetramera</i>				+		
Cupressaceae						
<i>Actinostrobus acuminatus</i>			+			
Cuscutaceae						
* <i>Cuscuta epithymum</i>				+		
Cyperaceae						
<i>Baumea juncea</i>				+		
<i>Baumea rubiginosa</i>				+		+
<i>Cyathochaeta avenacea</i>			+		+	
* <i>Cyperus tenellus</i>				+		
<i>Isolepis congrua</i>				+		
<i>Isolepis cyperoides</i>						+
<i>Isolepis marginata</i>	+				+	+
<i>Isolepis nodosa</i>				+		

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Isolepis oldfieldiana</i>			+	+		
<i>Isolepis setiformis</i>				+		
<i>Isolepis stellata</i>				+		
<i>Lepidosperma angustatum</i>			+		+	+
<i>Lepidosperma longitudinale</i>				+		+
<i>Lepidosperma tenue</i>					+	+
<i>Lepidosperma squamatum</i>					+	+
<i>Mesomelaena graciliceps</i>			+		+	
<i>Mesomelaena tetragona</i>				+		+
<i>Schoenus brevisetis</i>					+	+
<i>Schoenus curvifolius</i>	+		+			
<i>Schoenus efoliatus</i>	+		+		+	+
<i>Schoenus subbulbosus</i>			+		+	
<i>Tetraria capillaris</i>					+	+
<i>Tetraria octandra</i>			+			+
<i>Tricostularia neesii</i>	+				+	+
Dasypogonaceae						
<i>Calectasia narragara</i>			+			
<i>Dasypogon bromeliifolius</i>			+		+	
<i>Kingia australis</i>	+				+	+
<i>Lomandra brittanii</i>						+
<i>Lomandra caespitosa</i>			+		+	+
<i>Lomandra drummondii</i>						+
<i>Lomandra hermaphrodita</i>	+		+			+
<i>Lomandra micrantha</i>					+	
<i>Lomandra nigricans</i>	+		+		+	+
<i>Lomandra aff.maritima</i> (GK 15065)	+					
<i>Lomandra pauciflora</i>				+		+
<i>Lomandra preissii</i>			+		+	+
<i>Lomandra purpurea</i>					+	+
<i>Lomandra sericea</i>					+	
<i>Lomandra sonderi</i>					+	+
<i>Lomandra spartea</i>	+					
<i>Lomandra suaveolens</i>			+			
Dennstaedtiaceae						
<i>Pteridium esculentum</i>				+		
Dilleniaceae						
<i>Hibbertia acerosa</i>			+			
<i>Hibbertia commutata</i>					+	
<i>Hibbertia cunninghamii</i>					+	+
<i>Hibbertia diamesogenos</i>			+		+	+
<i>Hibbertia huegelii</i>			+			

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Hibbertia hypericoides</i>			+			
<i>Hibbertia lasiopus</i>					+	
<i>Hibbertia perfoliata</i>				+		
<i>Hibbertia racemosa</i>			+			
<i>Hibbertia serrata</i>						+
<i>Hibbertia vaginata</i>			+			
Droseraceae						
<i>Drosera barbiger</i>					+	+
<i>Drosera erythrorhiza</i>			+		+	
<i>Drosera gigantea</i>				+		
<i>Drosera glanduligera</i>	+		+	+	+	+
<i>Drosera leucoblata</i>						
<i>Drosera macrantha</i>				+		
<i>Drosera marchantii</i> subsp. <i>marchantii</i>						+
<i>Drosera menziesii</i> subsp. <i>menziesii</i>			+			
<i>Drosera paleacea</i> subsp. <i>paleacea</i>					+	
<i>Drosera pallida</i>						+
<i>Drosera platystigma</i>	+					
<i>Drosera pulchella</i>				+		
<i>Drosera stolonifera</i>			+			
<i>Drosera subhirtella</i> subsp. <i>subhirtella</i>			+			+
Epacridaceae						
<i>Andersonia caerulea</i>			+			
<i>Andersonia heterophylla</i>			+			
<i>Andersonia lehmanniana</i>					+	+
<i>Andersonia involucrata</i>					+	+
<i>Astroloma ciliatum</i>					+	+
<i>Astroloma pallidum</i>			+		+	
<i>Conostephium pendulum</i>			+			
<i>Leucopogon australis</i>			+			
<i>Leucopogon capitellatus</i>					+	
<i>Leucopogon conostephioides</i>			+			
<i>Leucopogon glabellus</i>			+			
<i>Leucopogon gracillimus</i>			+			
<i>Leucopogon pendulus</i>					+	+
<i>Leucopogon propinquus</i>						+
<i>Leucopogon verticillatus</i>					+	+
<i>Lysinema ciliatum</i>			+			
<i>Sphenotoma capitatum</i>	+				+	+
<i>Styphelia tenuiflora</i>			+		+	
Euphorbiaceae						
<i>Monotaxis occidentalis</i>					+	

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Phyllanthus calycinus</i>					+	
<i>Poranthera microphylla</i>			+		+	+
<i>Stachystemon vermicillaris</i>					+	
Fumariaceae						
* <i>Fumaria capreolata</i>		+				
* <i>Fumaria muralis</i>		+	+			
Gentianaceae						
* <i>Centaurium erythraea</i>				+	+	+
<i>Sebaea ovata</i>				+		
Geraniaceae						
<i>Geranium solanderi</i>			+			
Goodeniaceae						
<i>Dampiera alata</i>				+		
<i>Dampiera linearis</i>			+		+	+
<i>Goodenia caerulea</i>	+		+			
<i>Goodenia eatoniae</i>					+	+
<i>Lechenaultia biloba</i>	+				+	+
<i>Lechenaultia expansa</i>			+			
<i>Scaevola calliptera</i>					+	
<i>Scaevola glanduligera</i>						+
<i>Velleia trinervis</i>				+	+	
Haemodoraceae						
<i>Anigozanthos flavidus</i>				+		
<i>Anigozanthos humilis</i>			+			+
<i>Anigozanthos manglesii</i>			+		+	+
<i>Anigozanthos humilis</i> x <i>manglesii</i>						+
<i>Anigozanthos viridis</i>				+		
<i>Conostylis aurea</i>					+	
<i>Conostylis aculeata</i>			+			
<i>Conostylis laxiflora</i>						+
<i>Conostylis setigera</i>					+	
<i>Haemodorum laxum</i>			+		+	
<i>Haemodorum simplex</i>				+		
<i>Haemodorum sparsiflorum</i>				+		
<i>Haemodorum spicatum</i>			+		+	
<i>Phelbocarya ciliatum</i>			+			
<i>Phelbocarya filifolia</i>			+			
<i>Tribonanthes australis</i>				+		
<i>Tribonanthes brachypetala</i>				+		

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
Haloragaceae						
Haloragis brownii				+		
Hydatellaceae						
Trithuria bibracteata				+		
Hypoxidaceae						
Hypoxis glabella var. glabella				+		+
Hypoxis occidentalis				+		
Iridaceae						
Orthrosanthus laxus var. laxus	+				+	+
Patersonia babianooides					+	+
Patersonia juncea					+	+
Patersonia limbata	+					
Patersonia occidentalis			+			
Patersonia umbrosa var. xanthina					+	+
* Romulea rosea		+		+	+	+
Juncaceae						
* Juncus bufonius				+		
* Juncus capitatus				+		+
Juncus holoschoenus				+		
* Juncus microcephalus				+		
Luzula meridionalis					+	
Lamiaceae						
Hemiandra pungens var. pungens			+			
Hemigenia humilis					+	
Lauraceae						
Cassytha micrantha				+		
Cassytha pomiformis			+		+	
Cassytha racemosa			+	+	+	
Lentibulariaceae						
Polypompholyx multifida				+		
Polypompholyx tenella				+		
Lindsaeaceae						
Lindsaea linearis					+	+
Lobeliaceae						
Isotoma hypocrateriformis						
Lobelia rhombifolia						

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Lobelia tenuior</i>						
* <i>Monopsis simplex</i>						
Loganiaceae						
<i>Logania campanulata</i>			+		+	
<i>Logania serpyllifolia</i> subsp. <i>serpyllifolia</i>	+				+	
<i>Logania</i> sp. nov. (GK 15011)	+				+	+
<i>Phyllangium paradoxum</i>			+		+	+
Loranthaceae						
<i>Nuytsia floribunda</i>	+		+		+	+
Menyanthaceae						
<i>Villarsia albiflora</i>					+	
<i>Villarsia parnassifolia</i>					+	
Mimosaceae						
<i>Acacia applanata</i>			+			
<i>Acacia extensa</i>			+	+		
<i>Acacia flagelliformis</i>			+			
<i>Acacia huegelii</i>			+		+	
<i>Acacia luteola</i>					+	
<i>Acacia latericola</i>					+	+
<i>Acacia mooreana</i>	+					
<i>Acacia nervosa</i>					+	+
<i>Acacia obovata</i>					+	
<i>Acacia pulchella</i>			+	+	+	+
<i>Acacia saligna</i>				+		
<i>Acacia semitrullata</i>					+	
<i>Acacia stenoptera</i>			+		+	+
<i>Acacia teretifolia</i>					+	
<i>Acacia urophylla</i>				+		
<i>Acacia varia</i> var. <i>varia</i>					+	+
<i>Acacia willdenowiana</i>			+			
Myrtaceae						
<i>Agonis flexuosa</i>			+			
<i>Agonis grandiflora</i>	+				+	+
<i>Agonis linearifolia</i>				+		
<i>Astartea fascicularis</i>				+		
<i>Baeckea camphorosmae</i>					+	
<i>Calothamnus sanguineus</i>					+	+
<i>Calothamnus schaueri</i>				+		
<i>Calytrix flavescens</i>			+			
<i>Calytrix leschenaultii</i>			+			

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Chamelaucium erythrochlorum</i>	+		+			
<i>Darwinia oederoides</i>			+			
<i>Darwinia vestita</i>						+
<i>Eremaea pauciflora</i>			+			
<i>Eucalyptus calophylla</i>					+	+
<i>Eucalyptus haenatoxylon</i>	+					+
<i>Eucalyptus marginata</i>	+	+	+		+	+
<i>Eucalyptus rudis</i>				+		
<i>Hypocalymma angustifolium</i>				+		+
<i>Hypocalymma robustum</i>			+			
<i>Kunzea glabrescens</i>			+			
<i>Kunzea recurva</i>				+		+
<i>Melaleuca incana</i>			+	+		
<i>Melaleuca preissiana</i>				+		
<i>Melaleuca scabra</i>	+				+	+
<i>Melaleuca thymoides</i>			+			
<i>Pericalymma ellipticum</i>				+		
<i>Verticordia densiflora</i>				+		
Olacaceae						
<i>Olax benthamiana</i>					+	
Onagraceae						
<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>				+		
<i>Epilobium hirtigerum</i>				+		
Orchidaceae						
<i>Caladenia attingens</i> subsp. <i>attingens</i>	+		+			
<i>Caladenia cairnsiana</i>			+			
<i>Caladenia flava</i>	+		+		+	+
<i>Caladenia latifolia</i>					+	
<i>Caladenia longicauda</i> subsp. <i>clivicola</i>			+		+	
<i>Caladenia nana</i> subsp. <i>nana</i>					+	
<i>Caladenia reptans</i>					+	+
<i>Caladenia speciosa</i>					+	
<i>Cyanicula gemmata</i>			+		+	+
<i>Cyanicula sericea</i>			+		+	+
<i>Cryptostylis ovata</i>			+			
<i>Cyrtostylis huegelii</i>				+		
<i>Diuris corymbosa</i>	+					+
<i>Drakaea livida</i>			+			
<i>Elythranthera brunonis</i>			+		+	
<i>Elythranthera emarginata</i>					+	
<i>Eriochilus dilatatus</i>			+		+	
<i>Eriochilus scaber</i> subsp. <i>scaber</i>					+	+

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Leptoceras menziesii</i>			+		+	
<i>Leporella fimbriata</i>			+		+	
<i>Lyperanthus serratus</i>	+				+	+
<i>Microtis media</i>	+			+		+
* <i>Monadenia bracteata</i>		+	+	+	+	
<i>Paracaleana nigrita</i>			+			
<i>Præcoxanthus aphyllus</i>			+			
<i>Prasophyllum brownii</i>	+				+	
<i>Prasophyllum fimbria</i>				+		
<i>Prasophyllum parvifolium</i>			+			
<i>Pterostylis aff. nana</i>	+		+		+	+
<i>Pterostylis barbata</i>					+	+
<i>Pterostylis recurva</i>			+		+	
<i>Pterostylis vittata</i>			+	+	+	+
<i>Pyrochis nigricans</i>			+		+	+
<i>Thelymitra crinita</i>	+		+		+	+
<i>Thelymitra flexuosa</i>				+		
<i>Thelymitra fuscolutea</i>	+		+			
<i>Thelymitra vulgaris</i>			+		+	+
Orobanchaceae						
* <i>Orobanche minor</i>			+	+		+
Papilionaceae						
<i>Aotus procumbens</i>			+			
<i>Bossiaea eriocarpa</i>			+			
<i>Bossiaea sp. Waroona</i>	+				+	+
<i>Bossiaea linophylla</i>					+	+
<i>Bossiaea ornata</i>						+
<i>Chorizema glycinifolium</i>			+			
<i>Chorizema rhombeum</i>					+	
<i>Daviesia angulata</i>	+		+			
<i>Daviesia cordata</i>					+	
<i>Daviesia divaricata</i>					+	
<i>Daviesia physodes</i>					+	
<i>Daviesia preissii</i>			+			
<i>Gastrolobium spinosum</i>					+	
<i>Gompholobium capitatum</i>					+	
<i>Gompholobium confertum</i>			+			
<i>Gompholobium knightianum</i>	+		+		+	
<i>Gompholobium marginatum</i>			+		+	+
<i>Gompholobium polynorphum</i>					+	
<i>Gompholobium preissii</i>	+		+		+	+
<i>Gompholobium shuttleworthii</i>					+	
<i>Hardenbergia comptoniana</i>			+			

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Hovea chorizemifolia</i>					+	+
<i>Hovea trisperma</i> subsp. <i>trisperma</i>			+			
<i>Hovea trisperma</i> subsp. <i>grandiflora</i>	+				+	+
<i>Isotropis cuneifolia</i>			+		+	
<i>Jacksonia furcellata</i>			+			
<i>Jacksonia sparsa</i>			+			
<i>Kennedia coccinea</i>					+	+
<i>Kennedia prostrata</i>			+		+	+
<i>Latrobea tenella</i>				+		
* <i>Lotus angustissimus</i>		+	+			
* <i>Lotus suaveolens</i>		+				
<i>Nemcia capitata</i>			+		+	
<i>Nemcia whicherensis</i>	+					
* <i>Ornithopus compressus</i>		+	+			
* <i>Ornithopus sativus</i>		+				
<i>Pultenaea radiata</i>	+				+	
<i>Pultenaea reticulata</i>			+	+		
<i>Sphaerolobium medium</i>	+		+		+	
* <i>Trifolium campestre</i>		+				
* <i>Trifolium dubium</i>		+				
<i>Viminaria juncea</i>				+		
Philydraceae						
<i>Philydrella pygmaea</i>				+		
Phormiaceae						
<i>Dianella revoluta</i> var. <i>revoluta</i>	+		+		+	
Pittosporaceae						
<i>Marianthus candidus</i>	+				+	+
<i>Marianthus tenuis</i>			+		+	
<i>Pronaya fraseri</i>			+			
Poaceae						
<i>Agrostis avenacea</i>				+		
* <i>Aira cupaniana</i>	+	+	+	+	+	
<i>Amphipogon amphipogonoides</i>			+		+	
<i>Amphipogon laguroides</i> subsp. <i>laguroides</i>	+					
<i>Amphipogon turbinatus</i>			+		+	+
<i>Austrodanthonia occidentalis</i>	+		+			
<i>Austrodanthonia setacea</i>					+	+
<i>Austrostipa compressa</i>			+			
<i>Austrostipa semibarbata</i>	+		+		+	+
* <i>Briza maxima</i>	+	+	+		+	
* <i>Briza minor</i>		+		+		

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
Deyeuxia quadriseta				+		+
Dichelachne crinita				+		
* Lolium rigidum		+				
Microlaena stipoides				+		+
Neurachne alopecuroidea					+	+
* Poa annua		+		+		
Poa drummondiana			+			
Tetrarrhena laevis					+	+
* Vulpia myuros	+	+	+			+
Podocarpaceae						
Podocarpus drouyianus						+
Polygalaceae						
Comesperma calymega			+			
Comesperma volubile					+	
Comesperma virgatum					+	
Polygonaceae						
* Rumex acetosella		+		+		
Primulaceae						
* Anagallis arvensis var. arvensis		+				
* Anagallis arvensis var. caerulea		+		+		+
Proteaceae						
Adenanthos barbigerus					+	
Adenanthos meisneri			+			
Adenanthos obovatus				+		
Banksia attenuata			+			
Banksia grandis			+		+	
Banksia littoralis				+		
Conospermum capitatum			+			
Dryandra armata	+					
Dryandra bipinnatifida					+	
Dryandra lindleyana			+		+	+
Grevillea bipinnatifida					+	
Grevillea pilulifera					+	
Grevillea pulchella subsp. ascendens	+				+	
Grevillea quercifolia	+				+	
Grevillea trifida					+	
Hakea amplexicaulis					+	
Hakea ceratophylla				+		
Hakea cyclocarpa				+	+	+
Hakea lissocarpa					+	

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Hakea prostrata</i>			+		+	
<i>Hakea ruscifolia</i>			+			
<i>Hakea stenocarpa</i>			+		+	
<i>Isopogon sphaerocephalus</i>					+	+
<i>Lambertia multiflora</i> subsp. <i>darlingensis</i>	+					
<i>Persoonia elliptica</i>			+		+	
<i>Persoonia longifolia</i>			+		+	
<i>Persoonia saccata</i>			+			
<i>Petrophile linearis</i>			+			
<i>Petrophile striata</i>	+		+			
<i>Stirlingia latifolia</i>			+			
<i>Synaphea floribunda</i>			+			
<i>Synaphea gracillima</i>						+
<i>Synaphea petiolaris</i>			+			
<i>Synaphea</i> sp. Donnybrook (GK 14538)	+		+			
<i>Xylomelum occidentale</i>			+			
Ranunculaceae						
<i>Clematis aristata</i> var. <i>occidentalis</i>					+	
Restionaceae						
<i>Anarthria laevis</i>				+		
<i>Anarthria prolifera</i>			+		+	+
<i>Anarthria scabra</i>	+					
<i>Cyrtogonidium leptocarpoides</i>				+		
<i>Desmocladius fasciculatus</i>			+		+	
<i>Desmocladius flexuosus</i>					+	
<i>Hypolaena exsulca</i>			+		+	
<i>Hypolaena pubescens</i>						+
<i>Lepyrodia hermaphrodita</i>	+					
<i>Lepyrodia macra</i>	+					
<i>Lepyrodia muirii</i>				+		
<i>Loxocarya cinerea</i>				+	+	
<i>Lyginia barbata</i>			+			
<i>Meeboldina co-angustata</i>				+		
Rubiaceae						
* <i>Galium murale</i>		+		+		
<i>Opercularia apiciflora</i>					+	
<i>Opercularia hispidula</i>			+			+
<i>Opercularia vaginata</i>			+		+	
Rutaceae						
<i>Boronia dichotoma</i>			+			+
<i>Boronia fastigata</i> subsp. <i>fastigiata</i>	+		+			+

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
<i>Boronia ramosa</i> subsp. <i>anethifolia</i>			+			
<i>Boronia spathulata</i>					+	+
<i>Philothea nodiflora</i>						+
<i>Philothea spicata</i>	+		+		+	+
Santalaceae						
<i>Leptomeria cunninghamii</i>	+				+	
Scrophulariaceae						
* <i>Parentucellia viscosa</i>				+		
Selaginellaceae						
<i>Selaginella gracillima</i>				+		+
Solanaceae						
* <i>Solanum nigrum</i>		+				
Stackhousiaceae						
<i>Stackhousia pubescens</i>					+	+
<i>Tripterococcus brunonis</i>			+		+	+
Sterculiaceae						
<i>Thomasia grandiflora</i>					+	
Stylidiaceae						
<i>Levenhookia dubia</i>	+		+	+	+	+
<i>Levenhookia pusilla</i>			+	+	+	
<i>Levenhookia stipitata</i>			+		+	
<i>Stylidium adnatum</i>					+	
<i>Stylidium amoenum</i>					+	
<i>Stylidium brunonianum</i>			+		+	
<i>Stylidium calcaratum</i>	+		+		+	
<i>Stylidium carnosum</i>						+
<i>Stylidium crassifolium</i>						
<i>Stylidium junceum</i>				+		
<i>Stylidium luteum</i>						+
<i>Stylidium mimeticum</i>				+		
<i>Stylidium neutrophyllum</i>						+
<i>Stylidium petiolare</i>				+		
<i>Stylidium piliferum</i>			+		+	
<i>Stylidium repens</i> var. <i>repens</i>			+			
Thymelaeaceae						
<i>Pimelea preissii</i>	+					
<i>Pimelea rosea</i>	+					
<i>Pimelea suaveolens</i> subsp. <i>suaveolens</i>					+	+

Table 1 (cont.)

* Naturalised/ Scientific name	Habitat Code					
	Q	D	B	S	J	H
Tremandraceae						
<i>Tetratheca hirsuta</i>			+			
Violaceae						
<i>Hybanthus floribundus</i> subsp. <i>floribundus</i>						+
Xanthorrhoeaceae						
<i>Xanthorrhoea acanthostachya</i>	+					
<i>Xanthorrhoea gracilis</i>			+		+	
<i>Xanthorrhoea preissii</i>					+	+

The Orchidaceae (36 natives, 1 weed), Papilionaceae (36 natives, 6 weeds), Proteaceae (35 natives), Myrtaceae (27 natives), Cyperaceae (23 natives, 1 weed), Asteraceae (21 natives, 7 weeds), Anthericaceae (20 natives), Poaceae (14 natives, 6 weeds), Epacridaceae (18 natives), Dasyogonaceae (17 natives), Haemodoraceae (17 natives), Mimosaceae (17 natives) and Stylidiaceae (16 natives) are the most species rich families. These are the typical species-diverse families of the higher rainfall areas of southern Western Australia.

The largest genera are *Acacia* (17 species), *Lomandra* (14 species), *Drosera* (14 species), *Stylidium* (13 species), and *Caladenia* (11 species). The species richness of *Lomandra* is high but may reflect that the block is an interzone between two bio-geographic provinces.

SIGNIFICANT FLORA

One species, previously listed as declared rare flora (Atkins, 1996),

Chamelaucium erythrochlorum was recorded at the northern limit of its' range from Dardanup Block. It is now listed as a CALM Priority 4 species. Four other priority taxa (*Acacia flagelliformis*, *Acacia semitrullata*, *Caladenia longicauda* subsp. *clivicola*, *Chamelaucium erythrochlorum* and *Gastrolobium whicherensis*) (Atkins 2006) are also recorded from Dardanup Block.

Annotated Notes on Significant flora of particular interest

Thysanotus pseudojunceus
(Anthericaceae)

A rhizomatous herb, found from Albany to Alexandra Bridge in low *Eucalyptus marginata* woodland. The population in Dardanup Block is disjunct from Nannup and the northern limit of the species' range.

Actinostrobus acuminatus
(Cupressaceae)

A prostrate conifer from an underground stem which occurs

from Three Springs to Boyanup. Rarely recorded south of Perth; in 1996 there are three known populations, one at Pinjarra, one in Dardanup and one near Boyanup (in a sand mining lease). Since 1996 this species has also been located in the Argyle and Abba SFBs and two other isolated occurrences at Meelup Regional Park and Milyeannup Forest Block (south-west of Nannup). However the largest secure population is in Dardanup Forest Block.

Lomandra sp. nov. (G.J.
Keighery15065) (Dasyopogonaceae)

There are 14 species of *Lomandra* recorded from the block, one of the highest diversity of co-occurring and closely allopatric species known for this genus, normally only 3–5 species are found in a bushland area of this size and location. One of these is a new species allied to *Lomandra maritima*, a coastal species ranging from the Yalgorup to Shark Bay and *Lomandra nutans* an inland species growing from York to the Stirling Ranges. This species should be added to Priority flora list, as Priority 1.

Patersonia limbata (Iridaceae)

A tufted rhizomatous herb found from Cape Arid to the Stirling Ranges with disjunct scattered populations north-west of this area. Five species of *Patersonia* are recorded from the block, also a very high number for this genus.

Caladenia longicauda subsp. *clivicola*
A Priority 4 species occurs between Pinjarra and Cape Naturaliste.

Logania sp. nov. (GJK 15,234)
(Loganiaceae)

This undescribed species of *Logania* is currently only known from the northern Whicher Range, where it is found in the Jarrah woodland on colluvial surfaces. It is recommended that this species be listed as Priority 1.

Acacia flagelliformis (Mimosaceae)
A Priority 4 species, occurs from Harvey to Karridale.

Acacia mooreana (Mimosaceae)
A low shrub to 60 cm tall, occurs from Boyanup to Karridale. The population in Dardanup Block is at the northern limit of the species range.

Acacia semitrullata (Mimosaceae)
A Priority 2 listed species, occurs from Yarloop to Donnybrook and Yallingup on sandy soils.

Calothamnus schaueri (Myrtaceae)
A low spreading shrub found between Pingelly and the Stirling Range. The species is present as a series of disjunct populations in the forest and is rarely recorded this far west.

Chamelaucium erythrochlorum
(Myrtaceae)

A previously declared rare

species, now Priority 4, largely confined to the Blackwood Plateau and Whicher Scarp with one population on the Swan Coastal Plain near Busselton. The population in Dardanup Forest Block is the northern most.

Synaphea sp. Donnybrook
(B.J.Lepschi and T. Lally 3111)
(Proteaceae)

This new taxon confined to the northern Whicher Scarp in Dardanup, Crooked Brook and Argyle Forest Blocks was first collected during the survey (voucher G.J. Keighery 14538). This species should be added to Priority flora list, as Priority 1.

Gastrolobium whicherensis
(Papilionaceae)

This newly recognised species is only recorded from the Whicher Scarp and is listed as Priority 1. The Dardanup population is the type locality, currently the largest known population and the northern limit of the species.

Pultenea radiata (Papilionaceae)

Largely confined to the western edge of the Blackwood Plateau along the Whicher Scarp, at the northern limit of the species range.

Lambertia multiflora var
darlingensis (Proteaceae)

A tall shrub, occurring in scattered populations along the Darling scarp from Gingin to Busselton area. Previously a

priority species. The population in Dardanup Forest Block is disjunct from the nearest known populations near Pinjarra.

Xanthorrhoea acanthostachya
(Xanthorrhoeaceae)

A species confined to the Darling and Whicher Scarp. Previously recorded from Walyunga National Park to Harvey, it is near the southern margin of its range, which is in Argyle Block.

DISCUSSION

Dardanup Forest Block is the only vegetated conservation area known to encompass the Darling, Whicher Scarp and associated foothills of the eastern Swan Coastal Plain.

Three principal plant communities are present in the area: Jarrah Woodland, Marri-Jarrah-Mountain Marri woodland and *Banksia* woodland. Two described regional floristic community types (Gibson *et al.* 1994) are represented in the block; type 1a: *Eucalyptus haematoxylon*-*E. marginata* woodlands of the Whicher Scarp; and type 21b: Southern *Banksia* woodlands and Jarrah forest of the western edge of the Darling Plateau. Types 1a and 21b are at or near their northern limits in Dardanup Forest Block. These are some of the largest known occurrences of these poorly reserved community types. There is also several outcropping areas of quartzite with a distinctive

Lambertia dominated heath, which contains several of the most unusual flora records.

The block contains a vascular flora of at least 497 taxa; 457 are natives and 40 weeds. Six of these taxa are non-flowering plants, 181 are monocotyledons (165 natives and 16 weeds) and 310 are dicotyledons (286 natives and 24 weeds). The area supports a rich native flora mostly for an area in excellent condition and with few weeds, which are mostly confined to old gravel pits and track edges.

Five Priority taxa, and four taxa deserving of listing, are found on the study area. Three species (*Logania* sp. nov., *Lomandra* sp. nov. and *Synaphea* sp. Donnybrook) were discovered during the survey and are only known from the Whicher Scarp and are here at their northern extent.

This survey demonstrates that the study area has very high conservation values and suggests that further detailed flora surveys are required in adjacent forest blocks that encompass similar landforms to ascertain the ranges of these restricted species and to document their values.

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REFERENCES

- ANON. 1981. Bunbury - Burekup Sheet 2035 III and part Sheet 1935, Urban geology Series. Department of Minerals and Energy, Perth.
- ATKINS, K.J. 1996. Declared Rare and Priority List for Western Australia. Department of Conservation and Land Management, Western Australia.
- ATKINS, K.J. 2006. Declared Rare and Priority List for Western Australia. Department of Environment and Conservation, Western Australia.
- CHURCHWARD, H.M. and MCARTHUR, W.M. 1980. Landforms and Soils of the Darling System. In "Atlas of Natural Resources, Darling System, Western Australia." Department of Conservation and Environment, Western Australia.

DEPARTMENT OF CONSERVATION AND ENVIRONMENT 1983. Conservation reserves for Western Australia. The Darling System - System Six. parts 1 and 2. report13.

GIBSON, N., KEIGHERY, B.J., KEIGHERY, G.J., BURBIDGE, A.H. and LYONS, M.N. 1994. A Floristic Survey of the Swan Coastal Plain. Report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the

Conservation Council of Western Australia Inc.

HEDDLE, E.M., LONERAGAN, O.W. and HAVEL, J.J. 1980. Vegetation of the Darling System. In: atlas of natural resources, Darling System, Western Australia. Department of Conservation and Environment, Western Australia.

SMITH, F.G. 1973. Vegetation Map of Collie. Western Australian Department of Agriculture, Perth.